

## ASTR 288C – Lecture 2

Monday, 14 September 2009

### Course Web Site

[http://lheawww.gsfc.nasa.gov/~sholland/astr288c/autumn\\_2009/index.html](http://lheawww.gsfc.nasa.gov/~sholland/astr288c/autumn_2009/index.html)

## Finding Information I: Data Bases

### Introduction

The Web has become the standard repository of information in astrophysics. Many journals now only publish data in electronic form, and in most cases this data is only available through Web sites. Research libraries still carry journals, but many libraries are dropping subscriptions to smaller (and obscure) journals, and small institutions are starting to drop paper subscriptions in favour of on-line subscriptions. This trend is likely to continue, and it is not certain if print copies of journals are going to survive.

On-line publication has several advantages over the publishing data directly in journals, books, and catalogues.

- Online data is easy to find because it is searchable and indexed.
- Online data is stored electronically, so it is usually easy to convert it into a format that can be used by software.
- Online data can easily be updated and corrected.
- Online data can be dynamically generated.

There are, however, several problems with online data.

- One needs Web access to use it.
- Data can be changed and updated easily, so it is possible to lose old versions of a catalogue or a data base. This can be a problem when one is trying to work with a consistent data set, or when comparing new results to old data.
- Trust. Anyone can put data on the Web, so how does one know if the data is reliable?

Trust is a general problem on the Web. In astrophysics the problem is solved by using data that is hosted at the Web sites of trusted institutions such as NASA, an established observatory, a reputable university, or some other institution that has established itself over the years as being reliable.

### Astrophysics Data Bases

Using astrophysics data bases requires planning. In many ways this planning is similar to the planning that is required for making telescopic observations. One

needs to identify the question that one wants to answer, then work out what data or information is needed to answer that question. Next, one needs to find the appropriate data base and learn to use it.

There are too many Web sites hosting astrophysical data to discuss them all, so this section will cover some of the basic concepts common to all data bases, and illustrate them using a commonly-used Web-based astrophysical data base.

### What is a Data Base

A data base is a structured collection of records or data that are stored in a computer system. The information in a data base is organized and indexed in a way that allows data to be found quickly. This makes it easy to follow relationships between different records.

There are many different models for building a data base, but the internal details of how a data base is structured should be transparent to the user. If a data base has been properly constructed the user will only need to know one or two pieces of information about the data that they are interested in in order to query the data base and find all relevant information.

### NASA/IPAC Extragalactic Database (NED)

An example of an astrophysics data base is the NASA/IPC Extragalactic Database (NED) at <http://nedwww.ipac.caltech.edu/>.

NED is built around a master list of *extragalactic* objects for which cross-identifications of names have been established, accurate positions and redshifts entered to the extent possible, and some basic data collected. Bibliographic references relevant to individual objects have been compiled, and abstracts of extragalactic interest are kept on line. Detailed and referenced photometry, position, and redshift data have been taken from large compilations, catalogues, and from the literature. NED also includes images from the 2MASS survey, from the literature, and from the Digitized Sky Survey. NED's data and references are being continually updated, with revised versions being put on-line every approximately every two to three months.

# NASA/IPAC EXTRAGALACTIC DATABASE

- ▶ Latest Updates to NED and Level 5 Knowledgebase
- ▶ **NEW** Query Redshift-Independent Distances by Object Name
- ▶ **NEW** Redshift-Independent Distances in query reports
- ▶ **NEW** Query volumes of space around objects in query reports
- ▶ **NEW** Improved query reports including Index and SED preview
- ▶ **NEW** 450,000 object Associations between SDSS and other surveys



Notice: Ongoing upgrades to the user interface include changes to the HTML query reports. Automated queries should use XML (VOTable) output. [Details](#)

OBJECTS	DATA	LITERATURE	TOOLS	INFO
<a href="#">By Name</a>	<a href="#">Images By Object Name or By Region</a>	<a href="#">References by Object Name</a>	<a href="#">Coordinate Transformation &amp; Extinction Calculator</a>	<a href="#">FAQ Introduction</a>
<a href="#">Near Name</a>	<a href="#">Photometry &amp; SEDs</a>	<a href="#">References by Author Name</a>	<a href="#">Cosmology Calculators</a>	<a href="#">Features Graphical Overview</a>
<a href="#">Near Position</a>	<a href="#">Spectra</a>	<a href="#">Text Search</a>	<a href="#">FTP</a>	<a href="#">NED Source List</a>
<a href="#">Advanced All-Sky</a>	<a href="#">Redshifts</a>	<a href="#">Knowledgebase</a>	<a href="#">X/Y offset to RA/DEC</a>	<a href="#">NED Team</a>
<a href="#">IAU Format</a>	<a href="#">Redshift-Independent Distances</a>	<a href="#">Galaxy Distance Tabulations (NED-D)</a>	<a href="#">Batch Job Submission</a>	<a href="#">Comment</a>
<a href="#">By Refcode</a>	<a href="#">Positions</a>	<a href="#">Abstracts</a>	<a href="#">Pick Up Batch Job Results</a>	<a href="#">Web Links</a>
<a href="#">Object Notes</a>	<a href="#">Diameters</a>	<a href="#">Thesis Abstracts</a>	<a href="#">Skyplot</a>	<a href="#">Glossary &amp; Lexicon</a>

Interface last updated: 2 June 2009

Database last updated: 2 June 2009

- 163 million objects
- 170 million multiwavelength object cross-IDs
- 638 thousand associations (candidate cross-IDs)
- 1.5 million redshifts
- 1.7 billion photometric measurements
- 609 million diameter measurements
- 5.1 million objects linked to 71,596 journal articles
- 2.3 million images, maps and external links
- 56,405 spectra
- 18,150 redshift-independent distances for 5,049 galaxies
- 64,956 object notes
- 48,661 journal article abstracts

If your research benefits from the use of NED, we would appreciate the following acknowledgement in your paper: *This research has made use of the NASA/IPAC Extragalactic Database (NED) which is operated by the Jet Propulsion Laboratory, California Institute of Technology, under contract with the National Aeronautics and Space Administration.*



**JPL**

There are four broad sections to NED

- Objects
- Data
- Literature
- Tools

**Objects** provides detailed information on individual extragalactic sources such as galaxies, quasars, gamma-ray bursts, and so on. One can search for a source using its name or its coordinates (in a variety of systems). In general searching by coordinates is more reliable than searching by name. This is because many sources have several different names and catalogue numbers, so it is possible that the identifier that you used may be not recognized by NED. This is true for all data archives.

is

9/9/09 10:09 AM

[http://nedwww.ipac.caltech.edu/cgi-bin/nph-objsearch?objname=NGC+1...ongitude&of=pre\\_text&zv\\_breaker=30000.0&list\\_limit=5&img\\_stamp=YES](http://nedwww.ipac.caltech.edu/cgi-bin/nph-objsearch?objname=NGC+1...ongitude&of=pre_text&zv_breaker=30000.0&list_limit=5&img_stamp=YES) Page 1 of 3

SuperGalactic 263.811944 -59.232415 1.25E+00 1.25E+00 0

Additional detailed measurements with references are also available by clicking below:  
[3 Position data point\(s\)](#)

**NEW** REDSHIFT-INDEPENDENT DISTANCES for NGC 1701 ([Back to INDEX](#))

N/A

FOREGROUND GALACTIC EXTINCTION for NGC 1701 ([Back to INDEX](#))

Galactic Extinction (Burstein & Heiles):  $A_B = 0.000$  mag [1982AJ....87.1165B](#)  
Galactic Extinction (Schlegel et al.):  $A_B = 0.056$  mag [1998ApJ...500..525S](#)  
 $E(B-V) = 0.013$  mag.  
The values listed below are calculated following Schlegel et al. Appendix B.  
See [Notes on Galactic Extinction](#) for important caveats.  
Bandpass U B V R I J H K L'  
Wavelength [um] 0.34 0.44 0.54 0.65 0.80 1.27 1.67 2.22 3.81  
 $A_{\lambda}$  [mag] 0.070 0.056 0.043 0.035 0.025 0.012 0.007 0.005 0.002

BASIC DATA for NGC 1701 ([Back to INDEX](#))

Helio. Radial Velocity : 5836 +/- 24 km/s  
Redshift : 0.019467 +/- 0.000080 [2003AJ...412...57P](#)  
Major Diameter (arcmin) : 1.2  
Minor Diameter (arcmin) : 0.9  
Magnitude and Filter : 13.61  
Classifications : (R)SA(r)b

**NOTE:** This information is indicative only. With the exception of the redshift they are unreferenceed and highly inhomogeneous as to their origin. The Radial Velocity (when available) is computed from the listed redshift. The remaining values are designed to orient the user with a quick-look, overall assessment of the general properties of the object in question. They are not averages nor are they standardized in any way.

Additional detailed measurements with references are also available by clicking below:  
[3 Redshift data point\(s\)](#) [22 photometric data point\(s\)](#) [17 Diameter data point\(s\)](#)

QUANTITIES DERIVED FROM REDSHIFT for NGC 1701 ([Details](#))([Back to INDEX](#))

**Calculated and Corrected Velocities**

V (Heliocentric) : 5836 +/- 24 km/s [2003AJ...412...57P](#)  
V (Galactocentric GSR) : 5683 +/- 25 km/s [1991RCJ...9.C....0000d](#)  
V (Local Group) : 5661 +/- 26 km/s [1996AJ...111..794K](#)  
V (3K CMB) : 5836 +/- 24 km/s [1996ApJ...473..576P](#)  
V (Virgo Infall only) : 5602 +/- 27 km/s [2000ApJ...529..786M](#)  
V (Virgo + GA only) : 5786 +/- 29 km/s [2000ApJ...529..786M](#)  
V (Virgo + GA + Shapley) : 5808 +/- 29 km/s [2000ApJ...529..786M](#)

Hubble Flow Distance and Distance Modulus (where  $H_0 = 73.0 \pm 5$  km/sec/Mpc)

D (Galactocentric GSR) : 77.8 +/- 5.5 Mpc (m-M) = 34.46 +/- 0.15 mag  
D (Local Group) : 77.5 +/- 5.4 Mpc (m-M) = 34.45 +/- 0.15 mag  
D (3K CMB) : 79.9 +/- 5.6 Mpc (m-M) = 34.51 +/- 0.15 mag  
D (Virgo Infall only) : 76.7 +/- 5.4 Mpc (m-M) = 34.43 +/- 0.15 mag  
D (Virgo + GA only) : 79.3 +/- 5.6 Mpc (m-M) = 34.50 +/- 0.15 mag  
D (Virgo + GA + Shapley) : 79.6 +/- 5.6 Mpc (m-M) = 34.50 +/- 0.15 mag

**Scale at Hubble Flow Distances**

Scale (Galactocentric GSR) : 377 pc/arcsec = 0.377 kpc/arcsec = 22.64 kpc/arcmin = 1.36 Mpc/degree  
Scale (Local Group) : 376 pc/arcsec = 0.376 kpc/arcsec = 22.56 kpc/arcmin = 1.35 Mpc/degree  
Scale (3K CMB) : 388 pc/arcsec = 0.388 kpc/arcsec = 23.26 kpc/arcmin = 1.40 Mpc/degree  
Scale (Virgo Infall only) : 372 pc/arcsec = 0.372 kpc/arcsec = 22.32 kpc/arcmin = 1.34 Mpc/degree  
Scale (Virgo + GA only) : 384 pc/arcsec = 0.384 kpc/arcsec = 23.06 kpc/arcmin = 1.38 Mpc/degree  
Scale (Virgo + GA + Shapley) : 386 pc/arcsec = 0.386 kpc/arcsec = 23.14 kpc/arcmin = 1.39 Mpc/degree

**NEW** To Search for Nearby Objects (Physical Companions): Enter Your Preferred Values and click on "Submit Environment Search" button  
Search for Objects within +/- 32 arcmin where 100 kpc = 4.321 arcmin  
Default Value is +/- 750 kpc and Selected Redshift, defined by the Velocity Range:  
from 5336 to 6336 km/sec where V(Heliocentric) = 5836 km/sec  
Default Value is +/- 500 km/sec [Submit Environment Search](#)

Cosmology-Corrected Quantities [ $H_0 = 73.00$  km/sec/Mpc,  $\Omega_{\text{matter}} = 0.27$ ,  $\Omega_{\text{vacuum}} = 0.73$ ]

[Redshift 0.019467 as corrected to the Reference Frame defined by the 3K Microwave Background Radiation]

Luminosity Distance : 81.2 Mpc (m-M) = 34.55 mag  
Angular-Size Distance : 78.2 Mpc (m-M) = 34.46 mag  
Co-Moving Radial Distance : 79.7 Mpc (m-M) = 34.51 mag  
Co-Moving Tangential Dist. : 79.7 Mpc (m-M) = 34.51 mag  
Co-Moving Volume : 0.00212 Gpc<sup>3</sup>  
Light Travel-Time : 0.257 Gyr  
Age at Redshift 0.019467 : 13.042 Gyr  
Age of Universe : 13.299 Gyr  
Scale (Cosmology Corrected) : 379 pc/arcsec = 0.379 kpc/arcsec = 22.74 kpc/arcmin = 1.36 Mpc/degree  
Surface Brightness Dimming : Flux Density per Unit Area = 0.92578; Magnitude per Unit Area = 0.08373 mag

EXTERNAL ARCHIVES AND SERVICES for NGC 1701 <a href="#">Help (Back to INDEX)</a>	Site/Service
<b>Data Related Directly to Object Names</b>	
<a href="#">Query SIMBAD by primary NED object name -- NGC 1701</a>	<a href="#">SIMBAD (CDS, Strasbourg, France)</a>
<a href="#">Revised New General Catalogue -- NGC 1701</a>	<a href="#">VizieR Catalog Query (U.S. mirror, CfA/Harvard)</a>
<a href="#">ESO/Uppsala Survey -- ESO 422-G 011</a>	<a href="#">VizieR Catalog Query (U.S. mirror, CfA/Harvard)</a>
<a href="#">Morphological Catalog of Galaxies -- MCG -05-12-010</a>	<a href="#">VizieR Catalog Query (U.S. mirror, CfA/Harvard)</a>
<a href="#">2MASS Extended Source Images (JHKs) -- 2MASX J0455511-2953002</a>	<a href="#">NASA/IPAC Infrared Science Archive (IRSA)</a>
<a href="#">2MASS Extended Source Images (JHKs) -- 2MASX J0455511-295300</a>	<a href="#">NASA/IPAC Infrared Science Archive (IRSA)</a>
<a href="#">IRAS Point Source Catalog -- IRAS 04539-2957</a>	<a href="#">VizieR Catalog Query (U.S. mirror, CfA/Harvard)</a>
<a href="#">IRAS Faint Source Catalog -- IRAS F04539-2957</a>	<a href="#">VizieR Catalog Query (U.S. mirror, CfA/Harvard)</a>
<a href="#">The ESO-LV catalog -- ESO-LV 4220110</a>	<a href="#">VizieR Catalog Query (U.S. mirror, CfA/Harvard)</a>
<a href="#">Catalogue of Principal Galaxies -- PGC 016352</a>	<a href="#">VizieR Catalog Query (U.S. mirror, CfA/Harvard)</a>
<a href="#">Retrieve mean data from LEDA -- PGC 016352</a>	<a href="#">The Lyon/Meudon Extragalactic Database (LEDA)</a>
<a href="#">Retrieve catalog data for NVSS J045551-295252</a>	<a href="#">NRAO/VLA Sky Survey (NVSS)</a>
<a href="#">Query GALEX (NUV/FUV) Mission Archive (6' search radius) -- NGC 1701</a>	<a href="#">GALEX Mission Data Archive at MAST</a>
<b>General Archive Resources -- All queries centered at 04h55m51.1s, -29d53m00s (J2000)</b>	<b>Site/Service</b>
<a href="#">Optical and UV Mission Archives (Default search radius)</a>	<a href="#">Multimission Archive at STScI (MAST)</a>
<a href="#">Query High Energy Mission Archives (Default search radius)</a>	<a href="#">HEASARC (NASA/GSFC)</a>
<a href="#">Explore resources with DataScope (15' search radius)</a>	<a href="#">HEASARC (NASA/GSFC)</a>
<a href="#">Visualize Coverage Map with IMPRESS</a> Size: <input type="text" value="1 deg"/>	<a href="#">Astrophysics Data Facility (NASA/GSFC)</a>
<a href="#">Retrieve 2MASS Atlas Images</a> Band(s): <input type="text" value="Ks"/> Size: <input type="text" value="2'"/>	<a href="#">NASA/IPAC Infrared Science Archive (IRSA)</a>
<a href="#">Retrieve IRAS ISA Images</a> Band(s): <input type="text" value="60um"/> Size: <input type="text" value="30'"/>	<a href="#">NASA/IPAC Infrared Science Archive (IRSA)</a>
<a href="#">1-D Coadd of IRAS Scans (ADDSKAN/SCANPI)</a>	<a href="#">NASA/IPAC Infrared Science Archive (IRSA)</a>
<a href="#">Retrieve NVSS Image</a> Size: <input type="text" value="15'"/> <input checked="" type="radio"/> Contours (PS) <input type="radio"/> JPEG <input type="radio"/> FITS File	<a href="#">NRAO/VLA Sky Survey (NVSS)</a>
<a href="#">NRAO Archive 1 arcminute search radius (GBT, VLA and VLBA)</a>	<a href="#">The NRAO Data Archive System</a>
<a href="#">Search ATNF Observation Log</a> Size: <input type="text" value="15'"/>	<a href="#">ATNF Observatory Position Log Database</a>

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**Data** provides links to various data sets about the object of interest. An example, for the galaxy UGC 08335, is shown below. Here we are looking for spectra of the galaxy. NED does not contain all of the data that is available for a particular source, but it often contains a significant amount of the available data, and it can be useful as a starting point for finding more data in the literature, or in other online data bases. It can also be useful for determining who is working on a particular source (or has worked on it in the past), so that you can contact them to see if there is unpublished data available, or attempt to forge a collaboration.

NASA/IPAC EXTRAGALACTIC DATABASE

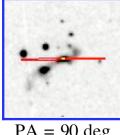
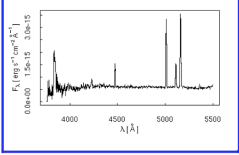
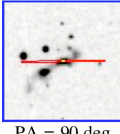
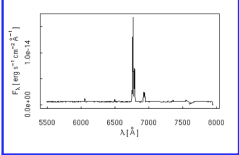
[Help](#) | [Comment](#) | [NED Home](#)

"UGC 08335" has multiple-object-type "GPair", performing extended name search.

A total of 3 unique objects found in NED.

No.	Object Name	Equatorial J2000.0		Distance from UGC 08335 (arcsec)	Object Type	Redshift	Number of Spectra	Essential Note
		RA	DEC					
1	<a href="#">UGC 08335</a>	13h15m32.80s	+62d07m37.00s	0.00	GPair	0.030831	0	N/A
2	<a href="#">UGC 08335 NED01</a>	13h15m30.74s	+62d07m45.20s	16.61	G	0.030788	2	N/A
3	<a href="#">UGC 08335 NED02</a>	13h15m35.06s	+62d07m28.60s	17.94	G	0.031065	2	N/A

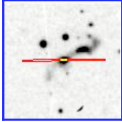
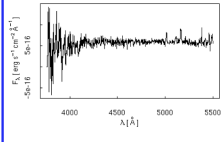
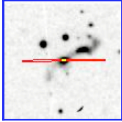
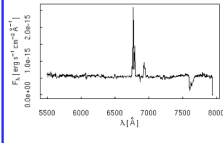
Spectral data in NED archive for object [UGC 08335 NED01](#)

Aperture/Beam	Spectrum Previews	Retrieve Data	Observational Information	Spectral Coverage & Resolution
 PA = 90 deg	 Launch <a href="#">Specview</a> Applet from <a href="#">STScI</a>	<a href="#">FITS</a> 3.8kb <a href="#">Author-ASCII</a> 20.0kb <a href="#">NED-ASCII</a> 102.8kb <a href="#">VOTable</a> 96.0kb  Reference: <a href="#">1995ApJS...98..129K</a>	<b>Region:</b> Nucleus <b>Telescope:</b> Palomar 200in <b>Instrument:</b> Double Spectrograph <b>Abs-Cal:</b> Yes <b>Ref-Frame:</b> Observed <a href="#">Full description</a>	<b>Band:</b> Optical <b>From:</b> 3758.7 Å <b>To:</b> 5502.3 Å <b>Step:</b> 2.2 Å <b>Resolution:</b> 10.0 Å
 PA = 90 deg	 Launch <a href="#">Specview</a> Applet from <a href="#">STScI</a>	<a href="#">FITS</a> 3.8kb <a href="#">Author-ASCII</a> 20.0kb <a href="#">NED-ASCII</a> 102.8kb <a href="#">VOTable</a> 96.0kb  Reference: <a href="#">1995ApJS...98..129K</a>	<b>Region:</b> Nucleus <b>Telescope:</b> Palomar 200in <b>Instrument:</b> Double Spectrograph <b>Abs-Cal:</b> Yes <b>Ref-Frame:</b> Observed <a href="#">Full description</a>	<b>Band:</b> Optical <b>From:</b> 5495.2 Å <b>To:</b> 7945.7 Å <b>Step:</b> 3.1 Å <b>Resolution:</b> 8.0 Å

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Spectral data in NED archive for object [UGC](#)

**08335 NED02**

Aperture/Beam	Spectrum Previews	Retrieve Data	Observational Information	Spectral Coverage & Resolution
 <p>PA = 90 deg</p>	 <p>Launch <a href="#">Specview</a> Applet from <a href="#">STScI</a></p>	<p><a href="#">FITS</a> 3.9kb  <a href="#">Author-ASCII</a> 20.0kb  <a href="#">NED-ASCII</a> 102.8kb  <a href="#">VOTable</a> 96.0kb</p> <p>Reference:  <a href="#">1995ApJS...98..129K</a></p>	<p><b>Region:</b> Nucleus  <b>Telescope:</b> Palomar 200in  <b>Instrument:</b> Double Spectrograph  <b>Abs-Cal:</b> Yes  <b>Ref-Frame:</b> Observed  <a href="#">Full description</a></p>	<p><b>Band:</b> Optical  <b>From:</b> 3758.7 Å  <b>To:</b> 5502.3 Å  <b>Step:</b> 2.2 Å  <b>Resolution:</b> 10.0 Å</p>
 <p>PA = 90 deg</p>	 <p>Launch <a href="#">Specview</a> Applet from <a href="#">STScI</a></p>	<p><a href="#">FITS</a> 3.8kb  <a href="#">Author-ASCII</a> 20.0kb  <a href="#">NED-ASCII</a> 102.8kb  <a href="#">VOTable</a> 96.0kb</p> <p>Reference:  <a href="#">1995ApJS...98..129K</a></p>	<p><b>Region:</b> Nucleus  <b>Telescope:</b> Palomar 200in  <b>Instrument:</b> Double Spectrograph  <b>Abs-Cal:</b> Yes  <b>Ref-Frame:</b> Observed  <a href="#">Full description</a></p>	<p><b>Band:</b> Optical  <b>From:</b> 5495.2 Å  <b>To:</b> 7945.7 Å  <b>Step:</b> 3.1 Å  <b>Resolution:</b> 8.0 Å</p>

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**Literature** will be covered in detail in the next lecture. This section gives one the ability to search for papers and articles about a given source.

**Tools** provides a set of tools for performing various tasks, such as determining Galactic extinction along a line of sight, coordinate transformations, and batch access to data. The NED tools are a very useful way to perform mundane calculations such as translating coordinates from one system (or epoch) to another.

### SIMBAD Data Base

The SIMBAD astronomical database at <http://simbad.u-strasbg.fr/simbad/> provides basic data, cross-identifications, bibliography, and measurements for astronomical objects outside the Solar System. SIMBAD is similar to NED, but it was intended to be primarily a stellar data base, not an extra-Galactic one. Over the years, however, it has grown to be a general-purpose astrophysics data base. It is often useful to use both data bases when looking for information.

### Online Sky Surveys and Catalogues

There are many online sky surveys and catalogues of astronomical objects, and many tools to query them. There are too many to discuss each one now, but a good starting point is the Digitized Sky Survey (DSS). One portal to this data is at [http://archive.stsci.edu/cgi-bin/dss\\_form](http://archive.stsci.edu/cgi-bin/dss_form). The DSS is a set of all-sky (or most of the sky) imaging surveys done at optical and near-infrared wavelengths with the goal of providing deep imaging of the entire sky. The limiting magnitude of DSS images varies greatly depending on the location on the sky, and on the particular survey data that was used to generate the images, but it is typically around 20<sup>th</sup> mag.

DSS images are very useful for creating finding charts for observing runs, and checking fields to see what sources are present. For example, a DSS image can tell you if there is a bright star in your field of view, or if the source that you are interested in overlaps a galaxy. DSS images are also useful for identifying transient sources. The STScI interface to the DSS looks like this. Notice that this interface has tools that can be used to help prepare *HST* observing proposals.

## The STScI Digitized Sky Survey

**NOTE:** To obtain target coordinates for **HST Phase 2 proposals**, select the HST Phase 2 (GSC2) survey option.

[ [New!](#) | [Help](#) | [FAQ](#) | [©](#) | [Acknowledging DSS](#) | [Other DSS Sites](#) | [CASG](#) | [Archive](#) | [STScI](#) ]

### [Get an Object's Coordinates](#)

Object name     
Get coordinates from ☒ [SIMBAD](#) ☐ [NED](#)

### [Retrieve an Image](#)

#### [Retrieve from](#)

POSS2/UKSTU Red  
POSS2/UKSTU Blue  
POSS2/UKSTU IR  
POSS1 Red  
POSS1 Blue  
Quick-V  
HST Phase 2 (GSC2)

([detailed information about the Surveys](#))

[RA](#)  [Dec](#)

[Height](#)  (max: 60.0) [Width](#)  (max: 60.0) arcminutes

[File format](#)  [Compression \(FITS only\)](#)

☐ Save file to disk (instead of displaying)

[HST Field of View Overlay \(1st generation GIF only\):](#)

[Roll angle \(V3\):](#)

[ [New!](#) | [Help](#) | [FAQ](#) | [©](#) | [Acknowledging DSS](#) | [Other DSS Sites](#) | [CASG](#) | [Archive](#) | [STScI](#) ]

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*Scientific citations of this data must include information given in the [acknowledgements](#).*

[archive@stsci.edu](mailto:archive@stsci.edu)

The field looks like this.






### Data Archives

Data archives are places where data from various observatories are stored. There are many archives on the Web, and each one has its own set of rules for accessing and using their data. In general archived data is freely available, but registration is often required in order to download data. This is done to keep track of usage, and to prevent indiscriminate downloading of data. Many observatories have a policy of keeping data proprietary for a period of time after the observations have been taken. This is done to allow the person who proposed for the observations to have period in which they have exclusive access to the data. The proprietary period varies from one observatory to another, and can also depend on the type of observation. The *Hubble Space Telescope*, for example usually gives observers a one-year proprietary period before data is available to the general astrophysics community. The *Swift* mission, on the other hand, makes all of its data public as soon as it has been processed—usually within two or three hours of the observations being made.

An example of an astrophysics data archive is the High Energy Astrophysics Science Archive Research Centre (HEASARC), which is hosted at NASA's Goddard

Space Flight Centre, and is on the Web at <http://heasarc.gsfc.nasa.gov/>. This archive contains data from all of NASA's high-energy astronomy missions. The site contains science data, calibration data, software, documentation, and other material needed to use the data in the HEASARC archive.

The easiest way to search for data in HEASARC is to use the Browse interface and simply type in the name of the source that you are interested in. For example, a search for all the *Chandra* data on the black hole Cyg X-1 yields this.

[Main Search Form](#) Browse Query Results   

[Query Information](#) [Query Results](#) [Data Products Retrieval](#) [Help](#)

chandra  
chanmaster

Click mission tabs (middle tab level) to display table tabs. Move cursor over tabs to see more information.

**Table Legend:**  
🔍 Display all parameters for a row  
⬆️ Sort by a column in order: 1,2,3 ⬆️ Sort by column in reverse order: 3,2,1 ⬆️/⬆️ Current table sort  
Services links: O: Digitized Sky Survey image, R: ROSAT All-Sky Survey image, N: NED objects near coordinates,  
S: SIMBAD objects near coordinates, D: get list of data products, H: analyze data products using [Hera](#),  
B: ADS bibliography holdings, F: FOV plot for observation

Data Products: Click checkbox to add row to Data Product Retrieval List

[Chandra Observations \(chanmaster\)](#) [Bulletin](#) [Note](#)  
Search radius used: 21.00 '

Select	Related Links	Services	obsid	status	name	ra	dec	time	detector	grating	exposure	type	p
<input type="checkbox"/> All			⬆️/⬆️	⬆️/⬆️	⬆️/⬆️	⬆️/⬆️	⬆️/⬆️	⬆️/⬆️	⬆️/⬆️	⬆️/⬆️	⬆️/⬆️ [s]	⬆️/⬆️	⬆️/⬆️
<input checked="" type="checkbox"/>	<a href="#">ASCA ROSAT RXTE XMM</a>	<a href="#">O</a> <a href="#">R</a> <a href="#">N</a> <a href="#">S</a> <a href="#">D</a> <a href="#">H</a> <a href="#">F</a>	3815	archived	CYGNUS X-1	19 58 21.70	+35 12 05.8	2003-03-04 15:45:02	ACIS-S	HETG	55850	GO	Lewin
<input checked="" type="checkbox"/>	<a href="#">ASCA ROSAT RXTE XMM</a>	<a href="#">O</a> <a href="#">R</a> <a href="#">N</a> <a href="#">S</a> <a href="#">D</a> <a href="#">H</a> <a href="#">B</a> <a href="#">F</a>	3814	archived	CYG X-1	19 58 21.70	+35 12 06.3	2003-04-19 16:46:27	ACIS-S	HETG	48330	GO	Pottsc
<input checked="" type="checkbox"/>	<a href="#">ASCA ROSAT RXTE XMM</a>	<a href="#">O</a> <a href="#">R</a> <a href="#">N</a> <a href="#">S</a> <a href="#">D</a> <a href="#">H</a> <a href="#">F</a>	7501	archived	Cygnus X-1	19 58 08.00	+35 20 23.1	2007-03-11 21:19:46	ACIS-I	NONE	46060	GO	Heinz
<input checked="" type="checkbox"/>	<a href="#">ASCA ROSAT RXTE XMM</a>	<a href="#">O</a> <a href="#">R</a> <a href="#">N</a> <a href="#">S</a> <a href="#">D</a> <a href="#">H</a> <a href="#">B</a> <a href="#">F</a>	2415	archived	CYGNUS X-1	19 58 21.70	+35 12 05.8	2001-01-04 06:02:43	ACIS-S	HETG	30150	DDT	Miller
<input checked="" type="checkbox"/>	<a href="#">ASCA ROSAT RXTE XMM</a>	<a href="#">O</a> <a href="#">R</a> <a href="#">N</a> <a href="#">S</a> <a href="#">D</a> <a href="#">H</a> <a href="#">B</a> <a href="#">F</a>	8525	archived	Cyg X-1	19 58 21.70	+35 12 05.3	2008-04-18 18:08:43	ACIS-S	HETG	30140	GO	Wilms
<input checked="" type="checkbox"/>	<a href="#">ASCA ROSAT RXTE XMM</a>	<a href="#">O</a> <a href="#">R</a> <a href="#">N</a> <a href="#">S</a> <a href="#">D</a> <a href="#">H</a>	11044	unobserved	Cyg X-1	19 58 21.70	+35 12 05.8	2010-01-19	ACIS-S	HETG	30000	GO	Nowal
<input checked="" type="checkbox"/>	<a href="#">ASCA ROSAT RXTE XMM</a>	<a href="#">O</a> <a href="#">R</a> <a href="#">N</a> <a href="#">S</a> <a href="#">D</a> <a href="#">H</a> <a href="#">B</a> <a href="#">F</a>	3407	archived	CYG X-1	19 58 21.60	+35 12 07.2	2001-10-28 16:13:52	ACIS-S	HETG	30000	DDT	Cui
<input checked="" type="checkbox"/>	<a href="#">ASCA ROSAT RXTE XMM</a>	<a href="#">O</a> <a href="#">R</a> <a href="#">N</a> <a href="#">S</a> <a href="#">D</a> <a href="#">H</a> <a href="#">B</a> <a href="#">F</a>	3724	archived	CYG X-1	19 58 21.80	+35 12 06.5	2002-07-30 17:26:13	ACIS-S	HETG	26400	DDT	Feng
<input checked="" type="checkbox"/>	<a href="#">ASCA ROSAT RXTE XMM</a>	<a href="#">O</a> <a href="#">R</a> <a href="#">N</a> <a href="#">S</a> <a href="#">D</a> <a href="#">H</a> <a href="#">F</a>	9847	archived	Cyg X-1	19 58 21.70	+35 12 05.3	2008-04-19 14:43:51	ACIS-S	HETG	19310	GO	Wilms
<input checked="" type="checkbox"/>	<a href="#">ASCA ROSAT RXTE XMM</a>	<a href="#">O</a> <a href="#">R</a> <a href="#">N</a> <a href="#">S</a> <a href="#">D</a> <a href="#">H</a> <a href="#">B</a> <a href="#">F</a>	107	archived	CYG X-1	19 58 21.71	+35 12 06.3	1999-10-19 19:16:33	ACIS-S	HETG	13960	GTO	Caniz
<input checked="" type="checkbox"/>	<a href="#">ASCA ROSAT RXTE XMM</a>	<a href="#">O</a> <a href="#">R</a> <a href="#">N</a> <a href="#">S</a> <a href="#">D</a> <a href="#">H</a> <a href="#">B</a> <a href="#">F</a>	1511	archived	CYG X-1	19 58 21.71	+35 12 06.3	2000-01-12 08:14:13	ACIS-S	HETG	12570	GTO	Caniz
<input checked="" type="checkbox"/>	<a href="#">ASCA ROSAT RXTE XMM</a>	<a href="#">O</a> <a href="#">R</a> <a href="#">N</a> <a href="#">S</a> <a href="#">D</a> <a href="#">H</a> <a href="#">F</a>	2743	archived	CYG X-1	19 58 21.70	+35 12 05.8	2002-04-13 20:51:58	ACIS-S	HETG	5230	GO	Zhang
<input checked="" type="checkbox"/>	<a href="#">ASCA ROSAT RXTE XMM</a>	<a href="#">O</a> <a href="#">R</a> <a href="#">N</a> <a href="#">S</a> <a href="#">D</a> <a href="#">H</a> <a href="#">F</a>	2742	archived	CYG X-1	19 58 21.70	+35 12 05.8	2002-01-30 01:22:27	ACIS-S	HETG	4750	GO	Zhang
<input checked="" type="checkbox"/>	<a href="#">ASCA ROSAT RXTE XMM</a>	<a href="#">O</a> <a href="#">R</a> <a href="#">N</a> <a href="#">S</a> <a href="#">D</a> <a href="#">H</a> <a href="#">F</a>	2741	archived	CYG X-1	19 58 21.70	+35 12 05.8	2002-01-28 05:33:28	ACIS-S	HETG	4490	GO	Zhang

14 rows retrieved from chanmaster

**Data Product Retrieval** **Further Actions:**

- Select the checkboxes for the rows of interest above.
- Un-check any data products below you are not interested in
- Select the Data Product Retrieval tab for retrieval options

Do you want to  your chanmaster results? ([help](#))  
Do you want to  your chanmaster results with another catalog or table? ([help](#))

Data Products available for chanmaster

- ☒ All
- ☒ Chandra Proposal Abstracts (abstracts)
- ☒ Events Lists (events)
- ☒ FITS and JPEG Images (images)
- ☒ Miscellaneous Files (misc)
- ☒ Orbit and Aspect Files (orbit)
- ☒ Processing Summary Files (psumm)

[Show current rows selected for Data Products Retrieval](#)  
[Browse Feedback](#)

Once the data that you are interested in have been found it can be examined by selecting the data set of interest and clicking the appropriate buttons. For example, to look at the *Chandra* data from 2003-03-04 15:45:02 just check the appropriate box and retrieve the data.

[Archive](#)

Data Products for selected rows

[Choose Tables](#) > Choose Data Products > Retrieve Data Products

- Do you want to view a data product? Click on its hyperlinked data format.
- Do you want to retrieve data products in a tarfile? Check the boxes beside each product and click one of the buttons at the bottom of the page.

☐ Select all products for all rows[Chandra Observations \(chanmaster\)](#) [FTOOLS](#)

obsid	status	name	ra	dec	time	detector	grating	exposure	type	pi	public_date
3815	archived	CYGNUS X-1	19 58 21.70	+35 12 05.8	2003-03-04 15:45:02	ACIS-S	HETG	55850	GO	Lewin	2004-03-19

☐ Select all products in this row**Chandra Proposal Abstracts**☐ Remote: Chandra Proposal Abstract (@CXC)[HTTP](#)**Orbit and Aspect Files**

<input type="checkbox"/> Aspect Quality (pcadf163180658N002_aqual1.fits.gz)	<a href="#">FITS</a>	858 kB
<input type="checkbox"/> Aspect Solution (pcadf163180658N002_asol1.fits.gz)	<a href="#">FITS</a>	14548 kB
<input type="checkbox"/> OBC Aspect Solution (pcadf163173430N002_osol1.fits.gz)	<a href="#">FITS</a>	364 kB
<input type="checkbox"/> OBC Aspect Solution (pcadf163179990N002_osol1.fits.gz)	<a href="#">FITS</a>	358 kB
<input type="checkbox"/> OBC Aspect Solution (pcadf163186550N002_osol1.fits.gz)	<a href="#">FITS</a>	351 kB
<input type="checkbox"/> OBC Aspect Solution (pcadf163193110N002_osol1.fits.gz)	<a href="#">FITS</a>	348 kB
<input type="checkbox"/> OBC Aspect Solution (pcadf163199670N002_osol1.fits.gz)	<a href="#">FITS</a>	41 kB
<input type="checkbox"/> OBC Aspect Solution (pcadf163200391N002_osol1.fits.gz)	<a href="#">FITS</a>	349 kB
<input type="checkbox"/> OBC Aspect Solution (pcadf163206951N002_osol1.fits.gz)	<a href="#">FITS</a>	350 kB
<input type="checkbox"/> OBC Aspect Solution (pcadf163213511N002_osol1.fits.gz)	<a href="#">FITS</a>	349 kB
<input type="checkbox"/> OBC Aspect Solution (pcadf163220071N002_osol1.fits.gz)	<a href="#">FITS</a>	267 kB
<input type="checkbox"/> OBC Aspect Solution (pcadf163225090N002_osol1.fits.gz)	<a href="#">FITS</a>	347 kB
<input type="checkbox"/> OBC Aspect Solution (pcadf163231650N002_osol1.fits.gz)	<a href="#">FITS</a>	349 kB
<input type="checkbox"/> OBC Aspect Solution (pcadf163238210N002_osol1.fits.gz)	<a href="#">FITS</a>	369 kB
<input type="checkbox"/> Orbit Ephemeris (orbitf163166700N001_eph1.fits.gz)	<a href="#">FITS</a>	282 kB

**Events Lists**

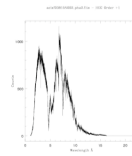
<input type="checkbox"/> Events List (acisf03815N002_evt2.fits.gz)	<a href="#">FITS</a>	755094 kB
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**Miscellaneous Files**

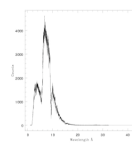
<input type="checkbox"/> Bad Pixel List (acisf03815_000N002_bpix1.fits.gz)	<a href="#">FITS</a>	7 kB
<input type="checkbox"/> Field-of-View File (acisf03815_000N002_fov1.fits.gz)	<a href="#">FITS</a>	7 kB

☐ Gain Plot (acisf03815N002\_heg\_plt2.jpg)[JPEG](#)

40 kB

☐ Gain Plot (acisf03815N002\_meg\_plt2.jpg)[JPEG](#)

34 kB

☐ Observation Index File (oif.fits)[FITS](#)

25 kB

☐ Secondary Products (secondary)[DIRECTORY](#) 810591 kB☐ Spectrum (acisf03815N002 pha2.fits.gz)[FITS](#)

1212 kB

**Processing Summary Files**☐ Observation Summary[HTML](#)

4 kB

☐ Observation Summary[HTML](#)

2 kB

☐ Observation Summary (acisf03815N002\_1\_sum2.ps)[PS](#)

190 kB

   [What is Hera?](#)Page maintainer: [Browse Feedback](#)

At this point one can download individual files, as needed. *It is important to find and read the appropriate documentation for a particular data set before downloading it.* In most cases auxiliary files are required to use the data correctly. These files can include, calibration data, spacecraft pointing information and engineering data, and data quality files. This information is different for every instrument, so it is critical for users to familiarize themselves with the observatory, and instrument, before using its data.

Some things to think about when downloading data from an archive are:

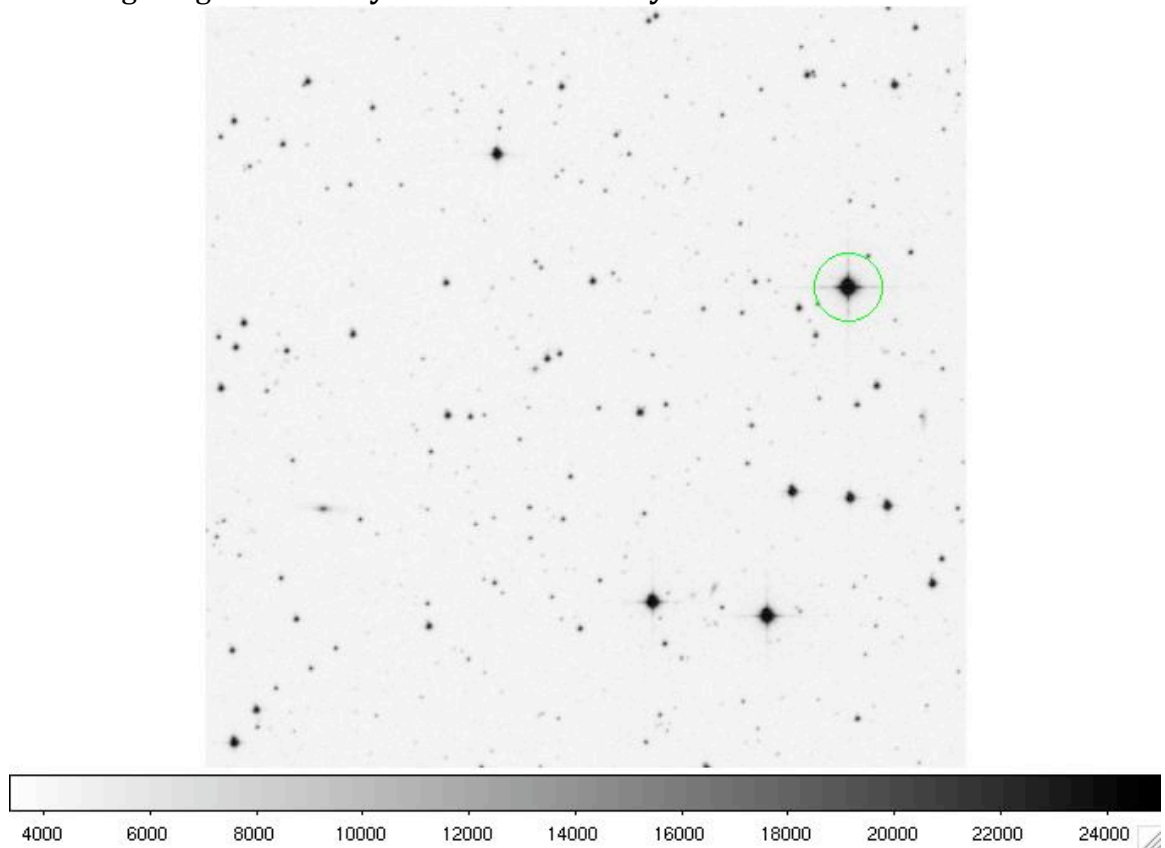
- What do I need to read to understand the data
- What files do I need?
- Is the data preprocessed?
- Is the data calibrated?
- What format is the data in?
- What software do I need to use the data?
- Who do I acknowledge when I publish the data?

Every data archive is structured differently, so it is important to read the help files, tutorials, and other descriptive information about each archive.

## Lab Work

- Log into your department unix account and start X Windows using the “startx” command.
- Download the file “ursa.cshrc” from [http://lheawww.gsfc.nasa.gov/~sholland/astr288c/autumn\\_2009/index.html](http://lheawww.gsfc.nasa.gov/~sholland/astr288c/autumn_2009/index.html)
- Copy your current .cshrc file to .cshrc.original (`cp -i .cshrc .cshrc.original`).
- Move ursa.cshrc to .cshrc (`mv -i ursa.cshrc .cshrc`).
- Log out completely and log in again. Start X Windows.
- Start a Web browser and navigate to the DSS ([http://archive.stsci.edu/cgi-bin/dss\\_form](http://archive.stsci.edu/cgi-bin/dss_form)).
- Use the DSS to get a FITS file of the field containing the gamma-ray burst GRB 081121. Use “Retrieve from POSS2/UKSTU Red”.
- In a terminal window start the ds9 image display
  - `astroload ds9`
  - `ds9 name_of_downloaded_FITS_file &`
- Go to “Catalogs” under the “Analysis Menu”. This sub-menu allows you to mark the positions of known sources on the image that you have displayed. Select the “USNO B1.0” catalogue under the “Optical” sub-menu. This is the United States Naval Observatory catalogue version B1.0. It contains positions, proper motions, and magnitudes for 1,042,618,261 objects down to a limiting magnitude of approximately  $V = 21$ .
- Think about the following questions.
  1. Are all the visible sources in the image also in the USNO B1.0 catalogue?
  2. Why are there sources in the catalogue that are not visible in the image?
  3. Why do some of the bright sources in the image have cross-like patterns of USNO B1.0 sources around them?
- Quit ds9 and restart it with the same file.
- Under the “Analysis” menu select “Image Servers” and “IPAC-2MASS”. Retrieve the 2MASS image. 2MASS is the Two-Micron All-Sky Survey, an infrared sky survey.
- Select “Tile Frames” from the “Frame”, or use the buttons.

- Experiment with the options under the “Scale” menu (or “Scale” button) until you are able to display both the DSS and 2MASS images side-by-side using the same scale parameters. The background should look approximately the same.
- Select the DSS image (by clicking on it) then match the coordinate systems of the two images using “Frame”→”Match Frames”→”WCS”.
- Experiment with ds9 using these two images.
- Quit ds9 and restart it with the same DSS FITS file.
- Answer the following questions about the source in the green circle in the following image. **Hand in your answers with your homework.**



1. What are the coordinates of this source?
2. What type of source is this? What is its name?
3. What is its *V*-band magnitude?
4. Has *Swift* observed this source? *Swift* data is archived at the HEASARC site <http://heasarc.gsfc.nasa.gov/>.
5. Look at the *Swift* OBSID 00335105000. Use “Preview and Retrieve”. Are there any UVOT image data for this source?